GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. ____

Project No. D-48-613 (Subproject under B-10-682) GTRI/~~GIT~~ DATE 7 /25 /83

Project Director: Anthony J. Bradshaw School/~~Lab~~: Architecture

Sponsor: Georgia Dept. of Human Resources; Division of Vocational Rehabilitation

Type Agreement: Authorization and Invoice V023113

Award Period: From 7/15/83 To 10/15/83 (Performance) ____/____ (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated:	$	$
Funded:	$ 1,929	$ 1,929

Cost Sharing Amount: $ Cost Sharing No:

Title: ~~Sharon P. Payne~~ Mouth Control Device

ADMINISTRATIVE DATA

OCA Contact Frank Huff X4820

1) Sponsor Technical Contact:

Joe Patrick
Georgia Dept. of Human Resources
Division of Vocational Rehabilitation
10th Floor, East Tower State Office Bldg.
47 Trinity Avenue, S.W.
Atlanta, Georgia 30334

2) Sponsor Admin/Contractual Matters:

Same

Defense Priority Rating: N/A Military Security Classification:

(or) Company/Industrial Proprietary:

RESTRICTIONS

See Attached N/A Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval — Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with Sponsor

COMMENTS:

Project Director will advise OCA when project is completed. Final invoice to be issued at that time. A&I is forwarded to Accounting for preparation. There are no reporting requirements.

COPIES TO:

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Center for Rehabilitation Technology

College of Architecture
Georgia Institute of Technology
Atlanta, Georgia 30332

(404) 894-4960

FINAL REPORT/PROJECT CLOSEOUT - OCTOBER 17, 1984

Project No.: *D48-613*
DHR A & I 023113

Client: *Sharon Payne*

Counselor: *Ruth Ann Long*

Project: *Mouth Control Device*

This project has been successfully completed and delivered to client. CRT worked with the Emory School of Dentistry in developing this unique, high speed, mouth switch. It incorporates a magnetic proximity "hall effect" switch into individually fitted dental plates. The client slightly slides her jaw forward to activate the switch and back to deactivate.

Budget activity is complete and the project can be billed.

A. J. Bradshaw
Project Director

AJB:ac

Attachments

EMORY UNIVERSITY
News and Information Services
Robert W. Woodruff Health Sciences Center Administration Building
Atlanta, Georgia 30322
404/329-5686

October 1, 1984

A 10/10

Mr. Ray Moore
Director of Institutional Relations
Georgia Institute of Technology
Atlanta, Georgia 30332

Dear Ray:

Here's the article I mentioned that reports joint Georgia Tech/Emory work. WSB-TV and CNN's medical unit both have taped earlier stages of the device, and Dr. DiPietro says that the working unit should be ready to go next week sometime. We'd like to go ahead and tape Mrs. Payne using it, with both Tony Bradshaw and Girald DiPietro there. Then go from there. The feature service package goes to about 2,000 media and we usually get a lot of calls.

Just wanted to make certain Georgia Tech was referred to accurately and that you are happy with all this. Please give me a brief call when you've had a chance to look it over.

Best wishes,

Sylvia Wrobel
News Officer
for Health Sciences

enclosure

for distribution in feature service package, mid-October

JAW MOVEMENTS HOLD OUT PROMISE FOR FOOT CONTROLS FOR PARAPLEGICS

A new approach to operating a magnetic switching device, using subtle shifts of the jaw, has enabled a wheel-chair bound Atlanta woman to play the piano once again, by giving her full use of the foot pedals.

The powerful magnetic proximity pedal control, the first and only one of its kind, is the combined effort of a research scientist and an engineer at Georgia Institute of Technology's Center for Rehabilitation Technology and the chairman of graduate prosthodontics at Emory University's School of Dentistry. The pedal control has given back to Sharon Payne one of the most valuable things an automobile accident seven years ago took away. Before the accident that left her paralyzed from mid-chest down, Mrs. Payne was a piano teacher and performer. After the accident, she continued to teach, talking students through the use of the pedals. Occasionally she played at a friend's wedding or some special ceremony, despite the incomplete sound: "So much of music is in the sustaining tone and resonance. It's the difference between painting in color or in black and white. When I did play at church, for sentiment's sake, I'd smile while there but cry all the way home."

But the biggest loss, she says, was the inability to throw herself into music. "Playing the piano had always been an emotional release for me. After the accident, at a time when I had enough frustration to sink the Queen Mary, my main source of release and comfort was gone."

Her father, an electrician, experimented with jointed sticks to push against the foot pedals by leaning toward them. But Mrs. Payne's particular spinal injury made this difficult. She has no abdominal muscles. She literally holds herself upright with her elbows or, more

laboriously, with her upper diaphragm. Simply keeping her arms free to range across the keyboard is a difficult balancing act. To ask more of the diaphragm muscles was exhausting. "And since I have no sensation there, I couldn't tell if I was pushing too hard and creating a whole new series of belly buttons!"

Georgia's Department of Rehabilitation Services referred her to Georgia Tech where A. J. Bradshaw and Rosser Pryor took the job of mimicking the human ankle --a strong structure with a wide range of complex motions-- as an engineering as well as electronic challenge. A piston approach --push, push, push-- was too slow and too blunt, jarring the strings and setting up unpleasant vibrations. Eventually the men worked out a Geneva Drive system, with a tie arm similar to the old locomotive trains, that more closely imitated the stroke of the human ankle, its arc and speed of movement.

But how to activate it? The traditional mouth control switch used by paraplegics, activated by "puffing and sipping," did not have adequate speed, subtlety, or precision.

That's when engineering turned to dentistry. Dr. Girald DiPietro, of Emory University's School of Dentistry, often molds appliances that restore facial structure and function destroyed by cancer, radiation treatment, or trauma, or that enable cerebral palsy or paralyzed persons to use their mouths to activate equipment. After studying the Georgia Tech device, Emory's DiPietro decided on a jaw-controlled proximity magnet to activate the foot pedal control, each command differing by how close together a powerful rare earth cobalt magnet was brought to a switch.

The magnet, no larger than a section of a thick pencil lead, was fitted into a plastic mold which in turn fits over Mrs. Payne's teeth (so precisely, in fact, that if she gets a large filling the mold may need adjusting). A smooth surface on both the upper and lower sections facilitates the sliding motion of the jaw that brings the magnet into different range of the switch. Before being put in the mouth, the

carefully crafted mold looks a bit like a mouth guard -- or those wax penny candy false teeth. Once in, however, it is undetectable except for a slender insulated wire running to a pocket battery and from there to the foot pedal control itself.

When Mrs. Payne slides her jaws forward even an infinitesimal distance, the response is virtually instantaneous. She can give the foot pedal as many as five different signals within one second if the music demands it, as occasionally --in the hands and feet of a very good pianist-- it does. For Sharon Payne, this means the music is back. The pleased Georgia Tech/Emory team is now studying how similar devices, utilizing the strength and range of motion of the jaw for control, might enable paraplegics to imitate the way their feet used to work, whether pounding a bass drum or working feet-operated sewing machines.

Photograph of device available
Radio actuality of researchers/Mrs. Payne available at 404-329-6216
For further information call Sylvia Wrobel 404-329-5686